

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT I, JOSEF NEFF of Eggwilstrasse 4, CH-9552 Bronschhofen, Switzerland, a Swiss citizen, have invented certain new and useful improvements in a MUSCLE STIMULATION- AND MASSAGE APPARATUS, of which the following is a specification:

FIELD OF THE INVENTION

The invention relates to a muscle stimulation- and massage apparatus according to the introductory part of the independent patent claim.

BACKGROUND OF THE INVENTION

Apparatus are applied in the field of fitness and therapy, which produce vibrations which are transmitted via a contact surface onto the person to be treated or trained. The vibrations may have a positive effect on muscles as well as on bones. An effective stimulation of muscle fibers is possible if the muscle fibers may be brought in an oscillating manner from a basic tonus into a threshold region with an increased tension. The basic tonus depends on the constitutional tonus and on the pretension selected during the treatment. The pretension results on the one hand due to the weight or the selected posture, and on the other hand due to a deliberate flexing of the muscles. The stimulation on account of the vibrations becomes optimal when it is capable of being transmitted onto the body or onto a muscle to be treated, with a large movement component in the direction of the muscle fibers to be stimulated. In order to amplify the effect of the treatment, the treated muscles may be massaged during the treatment. For this reason, the muscle stimulation apparatus should be constructed such that the treated muscles are comfortably accessible for a massage. With the treatment of bones, the vibration should be transmitted onto the body in the direction of the bone with an as large as possible movement component.

With a person to be treated, the vibration should be able to be transmitted at least via a contact surface for the feet and as the case may, be for the backside as well as in particular also via grips for the hands. Accordingly, the person to be treated is situated in a standing, sitting or hanging posture.

The vibration should have frequencies or periods in the region of the excitation and decay times of muscle fibers. The usual applications envisage excitation frequencies in the region of 1 to 60 Hz. Apparatus with a settable frequency permit an adaptation of the frequency to the purpose of treatment, and thus an optimal treatment. The amplitude of the vibration for example lies in the range of 1-10mm, preferably however of 4-6 mm. The weight which may be set into vibration, lies in the range of 10-150 kg.

EP-0'929'284 describes a muscle stimulation apparatus with two foot plates which travel apart and which are pivotally mounted on a horizontally running middle axis and may be set into pivot movements via in each case one shaft each by way of an eccentric transmission. In order to avoid an undesired imbalance of the shafts, the shafts are balanced by the attachment of

balancing weights. The apparatus however produces undesirably loud noises, which as air sound is transmitted directly and as body sound is emitted via the ground. The oscillations forming the bases of the noises arise due to the inertia forces of the foot plates pivoted up and down, wherein these forces which are opposite to the acceleration forces, are transmitted onto the apparatus and from this onto the ground. A further disadvantage of this solution lies in the fact that the foot plates, on account of their pivot movements, have the tendency to likewise displace the legs of the person standing on the plates, into a pivot movement. This pivot component of excitation must be accommodated proportionally by the ankles, the knees and the hip joints, which entails the danger of undesirable effects on the joints. Apparatus according to EP-0'929'284 are limited to the stimulation of the muscles in the longitudinal direction of the body and in particular to the leg muscular system. Vibrations which are to act on the muscles of the torso and the arms would have to act on the legs with undesirably large amplitudes, and be transmitted by these onto the torso on account of the damping in the ankles, knees and hip joints. This indirect excitation may lead to problems in the joints, and does not ensure a defined excitation with the torso muscles.

US-5,500,002 describes a solution which is similar to the embodiments of EP-0'929'284, with two foot plates which may be set into a pivot movement, wherein the foot plates may be excited with different and settable amplitudes. This solution likewise has the disadvantages described above.

US-5,273,028 describes a solution with a parallel vibrating plate, wherein the vibration is not produced by a rotating shaft, but via electromagnetic actuators. The application is limited to the stimulation via the feet and legs. Furthermore, noise arises from the electromagnetic actuators.

A further solution with electromagnetic actuators is known from US-5'484'388. It is the case of an application in the field of bone treatment, wherein a bone which is preloaded with a static force, is impinged with force impacts in the direction of the static force. The embodiment is constructed in a complicated manner, it is cumbersome in its application, and is not directed to vibrating muscle stimulation.

US-2,427,053 describes a device with vibrating surfaces in the region of a seat or back rest, wherein the movement is effected tangentially to the surface of the contact surfaces. Because tangential movements are already greatly damped in the region of the skin- and fat layer close to the surface, the desired muscle stimulation cannot be achieved in a sufficient scope.

An apparatus is also known from commerce, whose contact surface executes a forwards and backwards movement with a tilt component. Apart from the unacceptable production of

sound, the tilt component of the vibration is also an undesirable disadvantage of this solution. The apparatus comprises a rod arrangement which may be fastened at the contact surface and which extends up to beyond the body surface of a person to be treated. Grips are arranged at the upper end of the rod arrangement, so that as person may grasp the grips with tensed muscles for the stimulation of the arm muscles. The amplitude of the tilt component of the vibration is increased linearly by the rod arrangement. A movement at the grips arises on account of this, which is not suitable for the desired treatment.

SUMMARY OF THE INVENTION

It is the object of the invention to provide a muscle stimulation- and massage apparatus which overcomes the mentioned disadvantages and permits further fields of application.

This object is achieved by the features of the invention specified in the patent claims.

One additional advantage of the invention is the fact that the muscle stimulation- and massage apparatus according to the invention may also be equipped as a base apparatus for further applications by way of additional elements.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is hereinafter described in combination with the drawings. There are shown in:

- Figure 1a a muscle stimulation- and massage apparatus according to the invention, in a lateral view;
- Figure 1b a muscle stimulation- and massage apparatus according to the invention, from the front;
- Figure 2 the vibration unit in a cross section;
- Figure 3 the vibration unit in a view from the front with attached elements, and
- Figure 4 one variant of the leaf spring of Figure 2.

DETAILED DESCRIPTION

A muscle stimulation- and massage apparatus according to the invention, as is represented in the Figures 1a and 1b, comprises a foot plate 3, a column 2 and a vibration unit 1. The foot plate 3 circumscribes a rectangular surface. Rollers and/or runners 32 are attached in the regions of the corners of the rectangular surface. The column 2 stands on the foot plate 3. The column 2 comprises two guide rail towers which are laterally distanced to one another, each with at least one guide rail 21, 22. A lift 4 may be traveled up and down on the guide rails 21, 22, so that it may be brought into various heights with respect to the foot plate 3 and locked here. The lift has the shape of a U-shaped support with two lateral arms. The vibration unit 1 is fastened between the open ends, outside the region of the guide rails 21, 22. An evaluation and display unit 5 may be present at the upper end of the column 2. The oscillation number, the treatment duration, etc. may be read off from this. A pulse control may further be installed, which functions according to the known principle with the wireless pulse meter.

The foot plate 3 has the shape of a fork. Two fork ends 31 are arranged such that the free space therebetween corresponds at least to the width of the vibration unit 1. The vibration unit 1 may be traveled down so far on the lift, until it is located between the fork ends 31.

The lift 4 is displaceably fastened on the guide rails by way of rollers or sliding bearings. The rollers or sliding bearings ensure that the lift may be positioned according to wishes, and may also be firmly held there. It is provided with a lift drive 41. The lift drive 41 is advantageously arranged within the foot plate 3, so that the center of gravity of the whole muscle stimulation- and massage apparatus remains low. It drives the lift by way of a pull cable, toothed belt or spindle according to the known type. It is also possible to arrange the drive 41 in the lift itself. At least one of the guide rails may then be toothed, wherein the drive 41 is provided with a toothed wheel which engages into the toothing.

The vibration unit 1 is fastened on the stand of the lift 4 in a firm manner, or pivotally about a horizontal pivot axis. In the case of the pivotable fastening, it must be able to be fixed in all pivot conditions. For this, the lateral frame parts of the lift 4 may for example be provided with circular grooves or cut-outs in which locking means run in a displaceable manner. The vibration unit is locked in the desired pivot position by way of quick levers, winged nuts and likewise.

A cross section through the vibration unit is shown in Figure 2. The vibration unit 1 has roughly the shape of a parallelepiped. A housing 12 comprises a base, two parallel side walls and two parallel end walls. One side of the housing 12, here the upper one, is open. A vibration plate or a vibration cushion 11 with a rectangular base surface and an upwardly curved surface partly projects into the inner space of the housing 12. The distance between the housing inner wall and

the vibration cushion 11 is minimal. It is thus not possible to inadvertently come between this with a finger or object, and for this to become jammed. This serves for the safety of the person who is receiving the therapy and the person carrying it out. Injuries are ruled out.

The vibration drive is arranged in the housing 12 of the vibration unit 1. Here a drive shaft 14 is present parallel to the length of the housing 12. It comprises at least one eccentric 141. A coupling rod 142 is articulated on the eccentric 141. The coupling rod 142 connects the eccentric 141 to the vibration plate or to the vibration cushion 11 where it ends on a pivot joint 111. The rotational movement of the drive shaft is thus converted into a linear movement of the vibration cushion 11 and thus produces the up- and down vibration of the vibration cushion 11. The travel of the vibration cushion is selected between about 1 and 6 mm. Another eccentric may be designed according to the known design, such that the travel may be varied in a preset manner. The travel of the vibration cushion may then be varied between about 1 and 6 mm. One design with a variable cam may be constructed such that the travel may even be varied during the operation. Several eccentrics 141 each with a coupling rod 142 may be present, which permits a smaller dimensioning of the individual elements. A vibration cushion, a vibration rod a vibration foot rest or likewise may be attached with the design with a vibration plate.

The housing 12 comprises an intermediate base 121. It is provided with recesses through which the coupling rods 142 run. At least one spring unit 13 is fastened on the intermediate base 121. The spring unit 13 advantageously consists of a leaf spring 130 which is of one piece or is divided into several two-dimensional segments. In the variant according to Figure 2, it has a lower spring plate 132 or an upper spring plate 131. The lower spring plate 141 lies on the intermediate base 121 and there is fastened with a spring mounting 136. Here it likewise comprises a recess for the movement of the coupling rod 142. The upper spring plate 131 is fastened on the lower side of the vibration cushion 11 with a spring fastening 135, screws, rivets or likewise. The spring unit 130 between the upper and lower spring plate 142, 141 comprises at least in each case one spring angle 133 as a resilient connection of the upper and the lower spring plate 131, 132. The spring unit 130 seen from above, comprises a rectangular to square outline. It corresponds in area to maximally approximately the base area of the vibration cushion 11. Of course the spring unit 130 may be divided up into several individual leaf spring elements. This geometric design ensures the exact guiding of the vibration cushion 11 during operation. The leaf spring 130 not only assumes the guiding of the vibration cushion, but also the damping of the oscillations and accelerations in the upper and lower region of the movement of the vibration cushion and thus also significantly damps the noise caused by the vibrations and the mechanics. A vibration compensation shaft of the known type may be present in the vibration unit 12 for additional comfort.

Another design of the leaf spring is evident from Figure 4. The leaf spring here consists of a single spring plate 138. It may be flat, plane or curved and possibly biased. It may be constructed of one piece or of several layers and also consisting of different materials. Since the constructional height is smaller, it is advantageously fastened on a bearing block 137 on the intermediate base 121 with a spring mounting 136. Laterally, upper spring fastenings 135' are present on the lower side of the vibration plate 11, which are each provided with a receiver groove 137. The single spring plate is mounted with its lateral edges on the periphery in these receiver grooves 137. Some play is present between it and the receiver groove 139 for the movement of the single spring plate 138. The single spring plate 138, as the spring unit 13 described further above, may extend from one piece over approximately the whole surface of the vibration plate 11. It may also be subdivided as several parts into individual segments arranged next to one another, just as the spring unit 13. As an extreme case, it may even consist of a plurality of thin spring rods.

A design of at least two torsion springs may be applied instead of a leaf spring 130 or a single spring plate 138. The torsion springs are each fixed between the intermediate base 121 and the lower side of the vibration plate.

The vibration cushion has a hard core. It may consist of a metal-, wood- or plastic body. This is provided at the tip and laterally with a cushioning of leather or another suitable material of the known type.

The drive shaft 14 may be extended laterally up to the end sides of the housing 12 or even beyond. Additional apparatus may then be connected at these ends, which likewise may be set into rotation by the drive shaft. The additional apparatus may be screwed on or, provided with a bayonet-like or similar quick-closure, may be stuck on.

For example, as such an additional apparatus, a pulley 62 may be stuck on the drive shaft 14 at both sides (see Figure 1b). One may also use an eccentric disk in each case, on which further modules such as hand loops, freely rotating pulleys and likewise may be stuck on.

Since the vibration plate or the vibration cushion 11 are mostly moved with an amplitude of about 5 mm, one may achieve a different deflection or amplitude for certain therapies by way of the design of the eccentric disks. It is possible to select this in a large range. The eccentric disks may be fastened in the same directions or also in a rotationally offset manner. For example with eccentrics fastened rotationally offset by 180°, one may fit a belt. With this, one may carry out a vibration massage as is known from well known belt vibrators.

A further additional apparatus (see Figure 1b) forms a vibration rod 71 which is stuck laterally on the vibration cushion 11. The vibration rod is then located at a distance above the rest of the vibration cushion 11. Here too, hand loops or cable rollers (pulleys) 72 may be fixed. Thereby, the selective vibration stimulation of extremities of the person who is to undergo therapy is possible. The hand loops may also be used by a therapist, in order, when massaging a person undergoing therapy, to assist the massage by way of the vibration movement of the apparatus. For this, he leads his hand through the hand loop, so that his forearm rests in the hand loop and is moved by this whilst he carries out the massage with the surface of his hand.

Furthermore, for example a pull cable may be applied over the pulley, on whose one end a hand loop or a ring for hands, forearms, etc. and on whose other end an exchangeable weight or a settable loading spring is attached. This applies for both above additional apparatus.

An additional extension of the field of application of the muscle stimulation apparatus results with the combination of the vibration movement with a movement of the lift 4. For this, the lift is provided with a program control. It may thus be traveled continuously up and down over a certain height range during a certain therapy time, during which the vibration unit 1 is in action. A stimulation of the upper thigh muscle system transversely to the longitudinal muscle fibers is given as an example. For this, the vibration unit is pivoted such that the vibration movement is carried out perpendicularly to the column 2. The lift is programmed such that it simultaneously travels up and down over the region just above the knee up to just above the loin. This movement region must of course be set differently for each person and each muscle region.

For further simplifying and improving the therapy possibilities, the vibration unit is provided with a programmable control. With this, the time duration as well as the vibration frequency may be preset. The vibration frequency may also be changed for a determinable time. Thus one may prevent the muscle system adjusting to the set frequency and reducing the effect of treatment.

LIST OF REFERENCE NUMERALS

- 1 vibration unit
- 2 column
- 3 foot plate
- 4 lift
- 11 vibration plate/cushion
- 12 housing
- 13 spring unit
- 14 drive shaft
- 21 guide rail
- 22 guide rail
- 31 fork plate
- 32 rollers or skids
- 41 lift unit
- 111 pivot joint
- 121 intermediate base
- 130 leaf spring
- 131 upper leaf spring
- 132 lower leaf spring
- 133 spring angle
- 135 upper spring fastening
- 135' upper spring fastening
- 136 spring holder
- 137 bearing block
- 138 single spring plate
- 139 receiver groove
- 141 eccentric
- 142 coupling rod